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ABSTRACT

A computing literacy course at Michigan State University for non-computer science students was designed with a fixed course structure and continuously changing course content. The structure provides feedback for assessing students and revising content to meet the changing demands of client departments, changing student experience, and changing hardware/software environments. To address potential assessment problems, the course is entirely lab-based, replaces competitive grading with a collaborative learning model, and replaces "points" with a series of mastery learning bridge tasks (BTs). This assessment model provides greater opportunity for learning than traditional multiple choice examinations, actually indicates the concepts and competencies that the student has mastered, and is non-competitive. The model provides a database of student performance that is used to improve the instructional design of the course, refine the BTs, and help individual students better understand concepts. Tables are included that provide information on BT contents, BT attempt rates, course grades, and student evaluations. Sample BTs are appended. (Contains 12 references.) (MES)

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Mastering Computing Technology: A New Approach for Non-Computer Science Majors

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Purpose

Designing instruction to provide "computing literacy" for non-Computer Science students is a challenge faced by computer science departments in many colleges and universities. (Joyce, 1998; Kolesar & Allan, 1995; Townsend, 1998) To meet this challenge, we conducted a series of interviews with the Chairs of 67 departments on our campus to determine the needs of their students. Some themes we identified are:

- *Literacy is context-dependent*. Literacy differs for K-12 teachers, business majors and biology researchers.
- *Literacy does not require computer programming*. As computers and applications have become more powerful, programming knowledge has become less important for non-computer science majors.
- *Literacy requires performance-based assessment*. Literacy does not consist of abstract knowledge alone. The literate user is able to accomplish various tasks in some context. Thus, the best assessment requires the learner to demonstrate literacy in an authentic manner.
- *Literacy requires adaptability*. Regardless of the context, merely learning to perform a fixed set of tasks using specific software packages does not constitute literacy. Furthermore, rapid changes in computing environments, incoming student experiences, and the needs and expectations of client departments mandate continuous revision of the curriculum.

These themes led us to create a fixed course structure with continuously changing course content. The structure provides feedback for assessing students and revising the course content to meet the changing demands of client departments, changing student experience, and changing hardware and software environments.

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To meet the needs of the different client departments, we designed the course with "core" materials for the first half followed by "tracks" appropriate to various majors. However, computing concepts (e.g., data representation and abstraction) provide the foundation for the diverse application content.

This paper focuses on the key component of this system: performance-based assessment. We summarize how our assessments are designed and how the data from the assessments are used to improve student learning and revise the course.

Perspective and Method

A major limitation of many introductory courses is that assessment and evaluation depend on surrogate measures, such as exams and quizzes that test static recall. To address these problems, our course:

- *Is entirely lab-based* (Herrmann & Popyack, 1995; Kay, 1998). It consists of lab exercises that build on concepts from the readings and homework.
- *Replaces competitive grading with a collaborative learning model* (Johnson, Johnson, & Holubec, 1990; Johnson, Johnson, & Smith, 1991). This constructivist approach to learning reflects the way that technology is used in most workplace settings.
- *Replaces "points" with a series of mastery learning* (Block, Efthim, & Burns, 1989; Osin & Lesgold, 1996) ***bridge tasks*** (BTs.) At regularly scheduled intervals, each student takes a bridge task (BT) in which s/he must synthesize and apply the concepts and competencies to solve a set of authentic problems.

Bridge tasks (BTs) are evaluated on a mastery pass/fail basis. If a student demonstrates mastery on the first bridge task, he or she "locks in" a minimum grade of 1.0 in the course. For each subsequent BT passed, the student's course grade is incremented by 0.5 until she or he has passed the 3.0 BT. In the strict sense, this is a modified mastery model in that students must complete the five BTs within the confines of a semester (about 12 BT attempts), rather than having an unlimited amount of time.

Once a student passes the 3.0 BT, s/he may choose a semester project to attempt increase the course grade to 3.5 or 4.0.

This assessment model

- *provides greater opportunity for learning than traditional multiple choice examinations.* The students' focus shifts from accumulating points to mastering concepts. Since students repeat failed bridge tasks until they pass, these repeats provide additional opportunities for learning.
- *actually indicates the concepts and competencies that the student has mastered.* In most courses, a grade of 2.0 means that a student has accumulated points from a variety of exams and homework assignments. It does not indicate what knowledge the student has. A 2.0 in

this course means that the student has demonstrated mastery of windowing skills, electronic mail, searching the Web, manipulating files and directory structures, and sufficient proficiency with word-processing to write a term paper.

- *is non-competitive*. Since students' grades are criterion-referenced rather than norm-referenced and are based on individual performance rather than group grading, the model facilitates collaborative learning and fosters cooperation and peer-teaching in the classroom.

Data Sources

Because of large enrollments (1800 students per semester) and resource constraints (two full time faculty plus Teaching Assistants) cost-effectiveness is a major design consideration. Performance-based assessments are usually more labor-intensive to create, administer and evaluate than traditional multiple choice or computer-based-training exams (Schoenfeld, 1994). To adapt performance-based assessments to a large enrollment course and use resources most effectively we considered several factors:

- The BTs must test appropriate concepts.
- The BTs must be individualized so that different students receive different BTs and repeated BTs differ.
- The evaluation criteria must ensure a high degree of consistency among graders and facilitate efficient grading.
- We must track and analyze student performance to verify that the instruction is meeting our design goals.

Each BT consists of multiple *dimensions*, each of which assesses certain concepts. Within each *dimension*, there are multiple *instances*, specific tasks to test the students' abilities to apply the concepts. Furthermore, each BT contains one or more *extension tasks*, materials not explicitly covered in the course but to which the students must apply the concepts. These *extension tasks* test transfer by having students apply the concepts to the solution of new problems.

Each student's BT is created by randomly selecting a single *instance* for each *dimension*. For each *instance*, there is a detailed set of *criteria* used to determine mastery of that *dimension*. Mastery on a BT is determined by combining mandatory and optional measures of mastery on the various *dimensions*. Details of the software infrastructure that supports the creation, delivery and grading of BTs are in Urban-Lurain & Weinshank (1999).

Some examples of BTs are included in appendix A. The BT contents are summarized in Table 1.

Table 1: Bridge Task Contents

Bridge Task	Concepts and Competencies
1.0	E-mail; Web; Distributed files; Help
1.5	Boolean searches of databases; Word-processing; Creating Web pages
2.0	Hardware; Software; More Word-processing
2.5	Spreadsheets (functions, charts)
3.0 Track A	Object embedding; Designing Web sites; Network communication tools
3.0 Track C	Advanced spreadsheets; Importing and transforming data; Data analysis; Add-on tools
3.0 Track D	Advanced spreadsheets; Fiscal analysis and modeling; Add-on tools

Results

This model provides a rich database of student performance that we use to

- *improve the instructional design of the course*. Reviewing BTs from fall 1997, we discovered that searching databases with Boolean operators had the highest failure rate. The instructional revisions we did for the spring course dramatically improved student performance on these dimensions.

- *refine the bridge tasks*. We initially structured the first few days of the course to accommodate a wide variability of incoming computing experiences. However, we discovered that this pacing lulled the students into a false sense of security. We changed both the content and timing of the 1.0 BT to address this problem.

- *help individual students better understand concepts*. Our software gives the students, TAs and instructors access to all student BTs. It displays the formatted text of any BT, the evaluation criteria, the graders' comments, and the student's results. This allows the students to identify their areas of weakness when preparing for subsequent BTs.

Table 2 shows two measures of the BT repeat rates for Spring 98. For each BT, the table shows the number of attempts to pass that BT. The data are presented both for the entire class and, separately, as a percentage of the students who eventually passed that BT. Since some students never pass all BTs, the *Percent of Class Passing* decreases on each successive BT.

For each BT, about 50% of the students pass on their first attempt, about 33% pass on the second and about 10% pass on the third.

There is no significant difference on the *Percent of students who passed BT* across BTs by single factor ANOVA across BTs (N=1770 students.) We therefore conclude that the BTs are of comparable difficulty.

Table 2: Bridge Task Attempt Rates

	One attempt		Two attempts		Three attempts		Four or more attempts	
Bridge Task	Percent of class passing	Percent of students who passed BT	Percent of class passing	Percent of students who passed BT	Percent of class passing	Percent of students who passed BT	Percent of class passing	Percent of students who passed BT
1.0	68%	71%	20%	21%	6%	7%	2%	2%
1.5	40%	43%	36%	39%	12%	13%	5%	5%
2.0	45%	52%	27%	30%	11%	13%	4%	5%
2.5	42%	53%	26%	33%	9%	12%	2%	2%
3.0	28%	46%	24%	40%	9%	14%	0%	0%

Table 3 shows the final course grade distribution from Spring 98 in tabular form. Grades of 3.5 and 4.0 are obtained by doing a semester project only following successful completion of the 3.0 BT.

Table 3: Course Grades

Final Grade	0.0	1.0	1.5	2.0	2.5	3.0	3.5	4.0
Percent of students	1.5%	3.9%	4.2%	9.3%	18.0%	19.5%	13.8%	29.9%

To those accustomed to a normal distribution, these results may be startling. However, as Bloom, Madaus and Hastings (1981) point out:

> If we are effective in our instruction, the distribution of achievement should be very different from the normal curve. In fact, we may even insist that our educational efforts have been unsuccessful to the extent that the distribution of achievement approximates the normal distribution. (p. 52)

We use BT data to revise the instruction and assessment. Based on the analyses of the BT performance statistics from fall 1997 semester, we made extensive revisions of the instruction

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and BTs before spring 1998. While the previous data show the internal consistency of these changes, student ratings provide an external measure of these changes across semesters.

Table 4 shows some of the Student Instructional Rating System (SIRS) data for the first two semesters we offered this course. Students are asked to respond to each statement on a scale of 1=strongly agree, 2 = agree, 3 = neither agree or disagree, 4 = disagree, 5 = strongly disagree.

Table 4: Student Evaluations

Question	Mean Fall 97	Mean Spring 98
I usually did my homework before coming to class.	3.47	2.23
I learned a lot in the group exercises in class.	3.79	3.15
The Bridge Tasks were a fair test of the material I learned in class.	3.50	2.29
I felt that the "extension tasks" on the Bridge Task, which asked me to do something I had not previously done, were reasonably connected to what I had already learned.	3.68	2.32
The grading was fair for the Bridge Tasks.	4.29	2.98
The grader's comments explained what I did wrong on the Bridge Tasks.	3.51	2.55
I feel that my course grade will reflect my understanding of computer concepts.	3.88	2.80
I would recommend this course to my friends.	3.70	2.48

On every question, the student ratings improved dramatically. The average overall improvement is 1.13 (on a scale of 1 to 5). All results are very highly significant by two-tailed T-tests. We attribute these improvements to the extensive revisions of the course and BTs we made from fall to spring.

Educational Importance

This course has been very well received by our client departments. As the first year's cohort progresses through the University, we expect that student grades in the course will successfully predict preparedness for subsequent courses in our client departments. This will allow our client departments to concentrate on using computing technology in their domains.

These results should be of interest to educators who are

- teaching technology literacy.
- teaching introductory computer science for non-computer science students.
- applying collaborative learning in large-enrollment courses.
- implementing mastery-learning, performance-based assessments in a fixed-semester environment.

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Appendix A: Sample Bridge Tasks

Each BT is individualized so that no two are identical. However, the skills and concepts are similar. This appendix contains examples of the 1.0, 2.0, 3.0 Track A (web site creation) and 3.0 Track C (spreadsheets for data analysis.) Additional examples, along with the grading criteria and information about the BTs are available on our web site: **www.cse.msu.edu/~cps101**. Follow the link to any of the **CPS 101 Student Pages**. From there, select the **Bridge Tasks** link.

Sample 1.0 BT from Fall 1998

Note: Many times students fail bridge tasks not because they do not understand how to do the tasks, but because they do not carefully read the bridge task. Be sure that you take the time to ***read the instructions carefully and double-check your work when you are through.***

For this bridge task you are Willy the mail boy's assistant. Due to Willy's general incompetence, he is in danger of being fired. If you successfully assemble and edit the files listed below, Willy is out, and you are the new head mail carrier. You will need to copy some files into your AFS Space and create some files of your own.

1. Using Windows 95 Help, figure out how to create a new folder in your AFS space.

The files you are collecting will be used by your pointy haired boss as part of the annual shareholders' report. Create a new folder named **Report** in your AFS space so that anyone can read from the files in it.

2. There is a file stored on AFS that you need.

Copy the file named **Fax-Jokes** from the Day 6 CPS 101 Course AFS space for your track into the new folder you created in your AFS space.

3. Your pointy haired boss lost one of the files that you need. Use the Help System to learn how to find files on your computer.

All that he can remember is that it is named **hightech.dot** and is stored on the C: drive. Find it and copy it to the folder that you made for this bridge task. After you have copied it, use the Windows 95 Help System to figure out how to rename a file. Rename this file **Headhunters.** Do not give this file any extension. You should ignore the warning you will receive that the file may become unusable.

4. Using Windows 95 Help, you need to find a particular application. You'll use this to create a file for your boss which will help you get Willy's job.

Find the application named **Notepad.** The Notepad program will let you create and save a text file. Start Notepad and enter in the following sentence (replace the blank with the name of a famous person):

My assigned partner is _____.

Save this file in the folder that you made for this bridge task with the filename **Partner.** Notepad will automatically add the file extension .txt to your file name. Do not remove or change the .txt extension.

Do not close this application as you will be adding more information to this file in the next question.

5. For the next question, you will need a message from your pointy haired boss giving you instructions that you need to follow to complete the question. To get this message, you will need to send an E-mail message to the correct address. If you do this, you will receive an E-mail message with the remaining information you need.

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Send an email message to **cps101bt1b@cps.msu.edu** (Note that the character 1 in the address is the **number one,** not the **letter l.**) The subject should be *AFS file*. You do not need to include any information in the body of the message.

If you do this correctly, you should receive a reply within one or two minutes.

Follow the directions in the reply you receive to complete this question on the Bridge Task.

Double check your work and make sure all of your files have been saved in the proper folder.

Use the Handin program to hand in all of the bridge task files from the folder which you copied, edited, or created for this bridge task. The Handin program can be started by selecting "File" and "Handin Files" from the menu in the bridge task software window.

You have completed bridge task 1.0. We will show you how to read your bridge task feedback in class on Day 7.

Sample 2.0 BT from Fall 1998

Note: Many times students fail bridge tasks not because they do not understand how to do the tasks, but because they do not carefully read the bridge task. Be sure that you take the time to read the instructions carefully and double check your work when you are through

SAVE EARLY, SAVE OFTEN!!!

If the next question does not specify a new file, continue making changes to the file you used in the previous question. When you are done, SAVE YOUR WORK!!!

Check your bridge Task. There should be five questions. If you have fewer than five questions, notify the proctor immediately.

Dogbert has noticed the superior quality of the work you've been doing for Wally, and he wants to borrow you to work on a project for him. Dogbert has a master plan for world domination, but he needs a governing document for his new ruling class, and he needs a computer to disseminate information to his followers.

1. Dogbert wants this information kept secret (for obvious reasons). Create a new folder named **Dogbert's** Files in your AFS space so that nobody else will be able to read the files you store there.

2. The first thing Dogbert wants from you is a governing document. Copy the constitution_styles.doc file that you worked on in class on Day 13 and Day 14 and which you modified for your homework into the folder that you created for this bridge task. This file must contain all the formatting that was required in class and also any formatting required in the Day 13 and Day 14 homework assignments.

Rename the copy in your bridge task folder **constitution_bt*MMDD*.doc** where ***MMDD*** are today's month and day. For example, if today were February 7, your filename would be *constitution_bt0207.doc*.

(Note: It is important to make a copy of the file for this bridge task rather than editing the original file in your AFS space. If you need to retake this bridge task, you will need to have the original file again!)

3. Dogbert likes that this constitution is long and has lots of confusing legal terms, but he thinks it could look a little bit nicer. He wants you to use **styles** to change the formatting of some of the text of the document.

Format the text of the **preamble** to the font Matura MT Script Capitals, engraved, 18 point, blue, 1 inch hanging indent, 16 point line spacing, and 12 points after the paragraphs. The preamble is the paragraph at

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the beginning of the constitution that begins with "We the people...". You need to make a new style to apply to the preamble to do this. Name the new style **The Beginning.**

Dogbert wants to subliminally program the In-duh-viduals to show respect to the Ruling Class in his new world order, so he wants to put subtle messages throughout this governing document that he is going to make all of his followers read.

In the preamble (the paragraph at the beginning of the constitution that begins with "We the people..."), add a footnote just after the word Justice in the first sentence. The footnote must be numbered **1**. It must contain the text **We love the Minister of the Snack Machine.** In the preamble, also add an endnote just after the text **Tranquility.** The endnote must be numbered **i.** It must contain the text **Dogbert is very clever.**

Dogbert still isn't satisfied with the appearance of the document.

- At the end of the document, after all of the rest of the text, add a bulleted list of people who will be in Dogbert's Ruling Class. These people are:

  Dogbert
  Gillian Anderson
  Colin Powell
  Larry Gonick
  Pat Schroeder

  Format the list to use check marks for the bullets.

- At the end of the document, after all of the text, insert a table that contains exactly 3 rows and exactly 2 columns. Fill the table with the following text, as shown:

Ruling Class	In-duh-viduals
Dogbert	Willy
	Pointy haired boss

  Type your name in the empty cell in the table. The words may wrap differently in the cells in the table in your document than they appear on this bridge task. Format the text in the table with the style Main Text 2.

- Set the left and right margins of the entire document to 0.75 inches.

Dogbert doesn't like the word "ratified" because it sounds like it involves rodents. Find a synonym for the word "ratified" and replace all occurrences of the word "ratified" in the document with the synonym you found.

4. Dogbert also needs a computer to aid in his quest for world domination. His loyal minions have narrowed down the list of possible choices to 8 different computers. Dogbert has a list of specifications for the computer that he needs. You need to check these specifications to determine the amount of RAM and hard drive storage capacity necessary and find the correct computer for Dogbert.

Dogbert has left the file U:\msu\course\cps\101\general_track_a\day15\computer.doc for you to fill out and tell him which computer he should buy. Copy this file into the folder that you made for this bridge task. Open this file in Word. Dogbert has posted his list of specifications in the CPS 101 newsgroup on Usenet. Find the posting by Dogbert with the subject **Dogbert's Leisure Configuration** and follow the instructions in that posting to select

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Dogbert's computer. Be very careful to select the correct posting so that you will be able to select the appropriate computer for Dogbert.

5. Dogbert wants to make sure that you're not an In-duh-vidual, so he wants one last test of your computer skills. At the bottom of the computer.doc document, you are asked for a path. Type the **full** path on the U: drive to the computer.doc file that you are currently editing for this bridge task. This is NOT the path to the CPS 101 course AFS space; it is the path to the file in your AFS space. (You must type the path for the file no matter whether you think the file is public or private.) Be sure to include the filename in the path.

Check your files *before* you hand them in.

After completing the files for this bridge task, use the Handin program to hand in the two Word files you edited.

You have completed the 2.0 Bridge Task. Your feedback will be available within a few days.

Sample 3.0 Track A BT from Fall 1998

Note: Many times students fail bridge tasks not because they do not understand how to do the tasks, but because they do not carefully read the bridge task. Be sure that you take the time to

READ THE INSTRUCTIONS CAREFULLY

and double check your work when you are through.

SAVE EARLY, SAVE OFTEN!!!

If the next question does not specify a new file, continue making changes to the file you used in the previous question. When you are done, SAVE YOUR WORK!!!

Check your bridge Task. There should be seven questions. If you have fewer than seven questions, notify the proctor immediately.

Note on the length of this Bridge Task: This Bridge Task is fairly long. Be sure to watch your time. If you get stuck or are having problems with parts of the Bridge Task, move on to other parts and then return to the parts where you are having problems at the end. **In particular, be sure that you complete the navigation toolbar question and test your navigation tools as you did in class.** This is a required part of the BT, so you need to have it working in order to pass the BT.

You have finally had enough of your pointy haired boss and his legion of evil minions. You're ready to pack it in, move to Sandusky, Ohio and ride roller coasters until you make yourself sick. All you need to do before you leave is line up a new cushy web page design job to support your theme park habit, and you'll finally be free of the travails and tedium of hard core computing. Adams, Inc. is holding a competition to select a new webmaster for their corporate site. If you submit a site that meets all of their requirements, you'll be selected for the job.

1. You must create a new folder in your **web** folder to organize all of the web pages and graphics you may need for the new web site that you'll make. This web site will be submitted to Adams, Inc.'s marketing department to demonstrate your web site building skills.

You must save all of the files that you create, modify, or use for this bridge task in this folder.

Name the new folder **MyEscape_*MMDD*** where *MM* is the current month and *DD* is the current date.

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For example, if today was February 14 the name of the folder would be **MyEscape_0214.**

You need to be sure that the marketing department will be able to view your pages. Be sure to test the pages as you build them by using the full **URLs** for the pages in the site.

Refer to pages 1-28 and 1-29 of the text for information on constructing URLs. The two folder names in the URL for this bridge task site are:

- **~pilotid** where **pilotid** is your pilot ID.
- **MyEscape_***MMDD* (the folder you created for this bridge task)

You should be able to construct the URL to this site from this information. Thus, the URL to the web page **dogbert.**htm in the above folder would be:

http://www.msu.edu/~pilotid/MyEscape_MMDD/dogbert.htm

2. Adams, Inc. has a template that they want you to use to design the web site.

Copy the file **U:\msu\course\cps\101\general_track_a\Day25\Gothic_template.htm** to the folder you created for this bridge task. Use this template to create all of the pages for this web site.

3. The Adams, Inc. marketing department has some guidelines about how to implement the template to design the web site.

- All of the text that is already in the template is formatted with a **single** font. Determine what font that is, and use it for **all** text that you add to the web site so that the site will be consistently formatted.
- You must not change the font formatting of the text **Page Top** and **top of the page.**
- You must not remove any horizontal lines or tables that are in the template.
- Use Help to find out about **targets.** Put a target at the beginning of the words **Page Top** on the template.
- Name this target **TheTop.**
- Create a link from the text **top of the** page to the target you just created so that clicking on the text **top of the** page takes you back to the text **Page Top.**

Be sure to save the changes to your template before you continue. (You can test that the link works correctly by adding several blank lines to the template - enough to make the page so long you have to scroll up and down to see the whole page - and clicking on the link. The link should bring you back to the target you placed at the text **Page Top.** The link may not appear to do anything if your page is not at least one "screen" long. Be sure to remove the blank lines before handing in your files.)

4. You must implement the web site flow chart below. Included in the flow chart are each of the web pages that must exist in your web site. The **file name** for each page is in **RED**, and the **page** title for each page is in **BLUE.**

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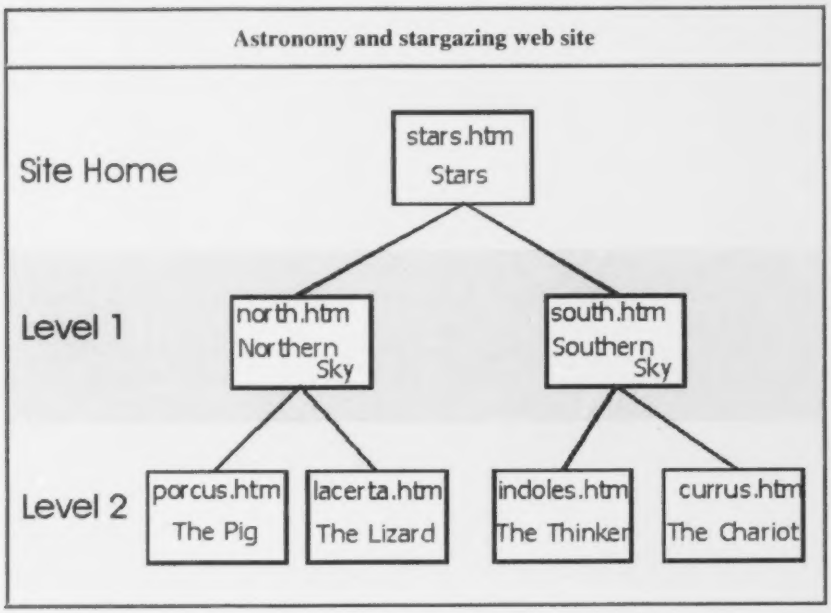

You must do the following in your web site implementation:

- Use Netscape Composer to create each of the web pages in the web site flow chart represented by a rectangle. Each of the pages you create must be based on the template that you copied for this bridge task.
- For each of your web pages in the web site flow chart:
  - Set the **page title property** of the page to the **Page title** given in the flow chart.
  - Replace the text **Page Top** on each page with that page's **Page title** from the flow chart. Be careful that you do not accidentally delete the target that you created when you make this edit.
  - Below the text *PUT BODY TEXT HERE* create links to all the web pages that are connected directly to that web page in the flow chart, both above and below. You may enter text or use images for your links. **HINT:** This means create a link for a web page, even if it also appears in the Navigation Tool that you make in question 5.

You need to add text to the **Site Home** page and each of the **Level 1** pages. On each of the pages, replace the text *PUT BODY TEXT HERE* with the following text:

- On the stars.htm page: **This is the web site of Adams, Inc. We produce the world's finest telescopes.**
- On the north.htm page: **These are constellations of the Northern Hemisphere.**
- On the south.htm page: **These are constellations of the Southern Hemisphere.**

The marketing department has left text for the **Level 2 pages** in a Usenet newsgroup posting.

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- Find a posting in the **CPS 101** newsgroup with the subject **Twinkle, twinkle, little stars** that was posted by **Adams, Inc.**.
- Read this posting, and follow the instructions for adding text to the Level 2 pages.

Double check all of your links (including the **top of the page link**) to make sure that they all work correctly).

5. The marketing department would like to see something a little more exciting than just text on the web site.

You need to add a java applet to the **site home page.** Go to the Day 25 web page for Track A. Find the link to the **spotLinks** java applet.

- Read the information about adding the applet to your web page.
- Add the **spotLinks** applet to the **site home** page above the text **top of the page .**
- Make the following customizations to the applet:
  - Set the button color code to **251,4,66**
  - Set the text color code to **250,254,71**
  - Set the highlighted text and button spot color code to **240,240,240**
  - Set the selected text and button spot color code to **0,255,64**
  - Set the first button to be highlighted when the applet is started.
  - Display **exactly 4** buttons
    - The first button must link to the Adams, Inc. home page, and the text displayed on the button must read Adams, Inc. . The URL of the **Adams, Inc.** home page is **http://www.unitedmedia.com/comics/dilbert/career/**
    - The second button must link to the CPS 101 web site. The text displayed on the button must read **CPS 101**
    - The third button must link to the Extension-o-matic home page, and the text displayed on the button must read **Extension-o-matic .** The URL of the Extension-o-matic home page is **http://www.student.com/feature/extensionomatic**
    - The fourth button must link to the Seinfeld-o-matic home page, and the text displayed on the button must read **Seinfeld-o-matic .** The URL of the Seinfeld-o-matic home page is **http://www.student.com/feature/seinfeldomatic**
- Make sure that the height and width of the applet are set correctly so that the entire applet is visible.
- Test the applet to be sure that it is working before you hand in your files.

6. You need to include a navigation tool so that the head of the marketing department can find her way around your site.

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- The navigation tool must be formatted as a table.
- The navigation tool must have a border width of 1.
- The navigation tool must have a cell padding of 1.
- The links in the navigation tool must be text, not images. You can use the **Page Title** of each of the pages to which you are linking as the link text.
- Each link in the navigation tool must be in its own cell.
- The text in the cells of the navigation tool must be right aligned.
- The navigation tool must appear in the correct location. Delete the text *PUT NAVIGATION TOOL HERE*, and replace it with your navigation tool.
- The navigation tool must appear on every page in your site.
- The navigation tool must contain links to the **Site Home** page, all **Level 1** pages from the site flow chart, and the **Centre for the Easily Amused** home page (the URL for the Centre for the Easily Amused home page is **http://www.amused.com**).
- Verify your navigation tool works appropriately. Check that each link in the Navigation Tool opens the correct web page.

7. You need to include contact information on your web site so that you can be informed when you are selected for the new job.

Beneath the text **top of the page** on your site's **Home Page,** add the following text:

Site design by _____. copyright 1998, CCC Web Design

Replace the blank with your name.

- Make your name a link to the home page of the **MyMSU site** you created in class on Days 20-23. Specify the **full** URL of the page in the link. You do not have to hand in the files in your **MyMSU site.**
- Use Help to find out about **mailto:** links.
- Create a link from the text **CCC Web Design** to the e-mail address of Thomas Izzo. Search the pilot address directory to find the address of Thomas Izzo.

Check your files *before* you hand them in. Thoroughly test your web site to make sure that all links work correctly and all required components are present.

After completing the files for this bridge task, use the Handin program to hand in all of the files for your web site. You should handin ALL web pages and image files or Java applet files you used to create this web site. This includes the edited template file, SEVEN web pages for the web site, and any image or applet files you used. You do not have to hand in the files in your MyMSU web site.

You have completed the 3.0 bridge task. Your feedback will be available within a few days.

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Sample 3.0 Track C BT from Fall 1998

Note: Many times students fail bridge tasks not because they do not understand how to do the tasks, but because they do not carefully read the bridge task. Be sure that you take the time to

READ THE INSTRUCTIONS CAREFULLY

and double check your work when you are through.

SAVE EARLY, SAVE OFTEN!!!

If the next question does not specify a new file, continue making changes to the file you used in the previous question. When you are done, SAVE YOUR WORK!!!

Check your bridge Task. There should be five questions. If you have fewer than five questions, notify the proctor immediately.

You have finally had enough of your pointy haired boss and his legion of evil minions. You're ready to pack it in, move to somewhere more pleasant, and goof off until your money runs out. All you need to do before you leave is decide on where you want to go, and you'll finally be free of the travails and tedium of computing.

1. You don't want your pointy haired boss finding out about your plans to abandon the company, so create a new folder in your AFS so that he won't be able to read the files stored there. Name this folder **MyEscape_*MMDD*** where *MM* is the current month and *DD* is the current day.

For example, if today was February 14 the name of the folder would be **MyEscape_0214.**

You need to examine the weather data for a city you are considering moving to. A travel agency that you have contacted has left instructions for finding a weather data file in a Usenet posting in the CPS 101 newsgroup.

> Find the posting by **Adams Travel** with the subject **32 N, 83 W and follow the instructions given there to start analyzing the new weather data.**

2. You notice that the same incompetent dope that saved the weather data files that you imported on Day 20 created the weather data file that you just imported, and some temperatures are in Celsius while others are in Fahrenheit. All of the temperature data need to be in the same scale so they can be compared.

> Add two new columns to the right of the existing data in the spreadsheet and label them **MAX TEMP C** and **MIN TEMP C.**
>
> Create a formula that will automatically detect whether the temperatures for each date are in Celsius or Fahrenheit, convert all Fahrenheit temperatures to the Celsius scale, and display Celsius temperatures **without** converting them. The same formula must be used for both maximum and minimum temperature columns and will require mixed cell references.
>
> Use this formula to calculate **MAX TEMP C** values based on the raw data values in **TMAX24** and to calculate **MIN TEMP C** values based on the raw data values in **TMIN24.** There must be MAX TEMP C and MIN TEMP C values for every record in the data set. The values must be rounded to the nearest integer (i.e. there are no digits to the right of the decimal point) using a built-in Excel function.
>
> The formula for converting values from Fahrenheit to Celsius is:
> **Degrees_Celsius = 5/9 * (Degrees_Fahrenheit - 32)**

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3. Now that you have your data organized, it needs to be summarized and displayed so it's easier to see the advantages of moving.

a) Use a pivot table to summarize the data.

- Use the **Month** column from your worksheet as the column labels.
- Use the PSUN24 values for the data values of the pivot table.
- Summarize by the **AVERAGE** of the PSUN24 values.
- The pivot table must appear on a new sheet.
- Rename the sheet that the pivot table is on to **Sun Table.**

b) Display the pivot table summary in a chart.

- Make a column chart using the **Clustered column with a 3-D visual effect** format.
- Add a meaningful chart title, x-axis title, and y-axis title.
- The legend should include meaningful text from the pivot table datasheet (not "Series1").
- Display the legend on the left side of the chart.
- Save the chart as a new chart sheet named **Average Sun.**
- Format the data series columns with the texture **purple mesh.** Clicking on a texture in the texture dialog window will display its name.
- Format the background chart area of the chart with the texture **white marble.**

4. You want to be able to easily compare your new weather data with the weather data you collected earlier.

- Copy the spreadsheet file which contains your Key West data to the folder that you created for this bridge task. This file must contain all of the data and formatting from the classwork and homework exercises for days 20 through 24. (Note: Be sure to make a copy of this file. If you have to retake this bridge task, you will need to use this file again!)
- Use Help to find out how to copy a worksheet from one workbook to another workbook.
- Copy the worksheet which contains the Key West weather data (not the histogram, pivot table, or any charts) to the workbook that contains the weather data that you imported for this bridge task. If you do this correctly, the file which contains the data you imported for this bridge task will also contain a sheet with the Key West data.
- Rearrange the columns in the worksheet containing the data which you imported for this bridge task.
    - The columns containing the data you imported in question 1 of the bridge task must be in the same order as the columns of data in your Key West weather worksheet (i.e. if TMAX24 data is in column E in your Key West worksheet, if should also be in column E of your new worksheet).

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- Put the converted temperature data from question 2 of the bridge task in the columns which correspond to the columns that contain MAX TEMP F and MIN TEMP F in your Key West worksheet. Note: do not be concerned if your two worksheets use different temperature scales. Just verify that the MAX and MIN columns correspond.

- There is no sunrise / sunset data for the city you imported in question 1 of the bridge task so do not worry about those columns.

5. You want to look closer at some of the weather data for the two locations in your workbook.

Use Help and your textbook to find out how to reference cell addresses from other worksheets in a workbook.

On a new blank sheet in the weather workbook you are editing for this bridge task, add the following entries:

- In cell B1, enter the location name of the city whose weather data you imported for this bridge task

- In cell C1, enter the location name of the city whose weather data you imported on Day 20 and are using for this bridge task

- In cell A2, enter the text "Average minimum:"

- In cell B2, use a FUNCTION to calculate the average daily minimum temperature for the city whose data you imported for this bridge task. Use the column of minimum daily temperatures that you calculated for this bridge task, not the raw data which you imported. This function must correctly reference data on the sheet containing that city's data.

- In cell C2, use a FUNCTION to calculate the average daily minimum temperature for the city whose data you imported on Day 20. Use the column of minimum daily temperatures that you converted to Fahrenheit, not the raw data which you imported. This function must correctly reference data on the sheet containing that city's data.

- Rename this worksheet **Minimum averages.**

This worksheet must have text, data or formulas only in the five cells specified above.

Check your files *before* you hand them in.

After completing the file for this bridge task, use the Handin program to hand in the Excel file you edited. You should handin ONE spreadsheet file consisting of a chart sheet and at least 3 worksheets which contain data.

You have completed the 3.0 bridge task. Your feedback will be available within a few days.

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